We claim:

1. A method of producing hydrogen comprising:

separating oxygen from a heated oxygen containing feed stream with an oxygen transport membrane to produce an oxygen permeate;

reacting said oxygen permeate, a hydrocarbon contained in a hydrocarbon containing feed stream, and steam contained in a steam feed stream in partial oxidation and reforming reactions to produce a crude synthesis gas comprising hydrogen, carbon monoxide, water, and carbon dioxide;

separating said hydrogen from said synthesis gas in a hydrogen transport membrane to produce a hydrogen-depleted crude synthesis gas and a hydrogen permeate;

forming a product stream containing hydrogen composed of said hydrogen permeate; and

combusting a stream of the hydrogen-depleted crude synthesis gas in the presence of an oxygen-containing feed stream, thereby to form said heated oxygen-containing feed stream.

2. The method of claim 1, wherein:

separation of the oxygen from the oxygen containing feed stream forms an oxygen depleted retentate;

said hydrocarbon containing feed stream is preheated and steam contained in said steam feed stream is produced through indirect heat exchange with a retentate stream composed of said oxygen depleted retentate.

3. The method of claim 2, wherein:

the partial pressure of hydrogen permeate is reduced through the use of a sweep gas composed of steam; and

water resulting from the use of the sweep gas is removed from a hydrogen permeate stream composed of the hydrogen permeate to form the product stream.

4. The method of claim 3, wherein:

separation of the oxygen from the oxygen containing feed stream forms an oxygen depleted retentate;

said hydrocarbon containing feed stream is preheated and said steam contained in said steam feed stream is produced through indirect heat exchange with a retentate stream composed of said oxygen depleted retentate.

5. The method of claim 4, wherein:

the steam within the sweep gas stream is superheated, a make-up water stream, provided for make-up of the steam, is preheated, and the hydrocarbon containing gas stream is preheated through indirect heat transfer with the hydrogen permeate stream; and

said water is removed from the hydrogen permeate stream after the indirect heat transfer by condensing said water and separating the condensed water in a phase separator.

6. The method of claim 1 or claim 2, further comprising pre-reforming ethane and other higher order hydrocarbons contained within the hydrocarbon

containing feed stream to methane prior to reacting said oxygen permeate with said hydrocarbon and said steam.

7. The method of claim 5, further comprising pre-reforming ethane and other higher order hydrocarbons, contained within the hydrocarbon containing feed stream to methane, prior to reacting said oxygen permeate with said hydrocarbon and said steam.

8. The method of claim 7, further comprising removing sulfur from the hydrocarbon containing feed stream.

9. The method of claim 7, comprising adding a part of said hydrogen to the hydrocarbon containing feed stream.

10. The method of claim 1 or claim 2, further comprising adding a part of said hydrogen to the hydrocarbon containing feed stream.

11. The method of claim 1 or claim 2, wherein:

the oxygen is separated from the oxygen containing gas and synthesis gas is generated in a first reaction stage;

a synthesis gas stream formed from the synthesis gas is introduced into a second reaction stage to separate the hydrogen from the synthesis gas and thereby to produce the hydrogen-depleted crude synthesis gas; and

the steam for the steam feed stream is produced through indirect heat exchange with said synthesis gas stream.

12. The method of claim 11, wherein:

the hydrocarbon containing feed stream and an air stream to supply the air for combustion of the hydrogen-depleted crude synthesis gas are preheated through heat exchange with a retentate stream composed of an oxygen depleted retentate formed by separation of the oxygen from the oxygen containing feed stream; and

a make-up water stream, provided for make-up of the steam, is preheated, and the hydrocarbon containing gas stream is preheated through indirect heat transfer with the hydrogen permeate stream.

13. The method of claim 12, further comprising removing sulfur from the hydrocarbon containing feed stream.

14. The method of claim 11, further comprising adding a part of the hydrogen to the hydrocarbon containing feed gas stream.

15. The method of claim 11, further comprising pre-reforming ethane and other higher order hydrocarbons, contained within the hydrocarbon containing feed stream, to methane prior to reacting said oxygen permeate with said hydrocarbon and said steam.

16. The method of claim 15, wherein:

the hydrocarbon containing feed stream and an air stream to supply the air for combustion of the hydrogen-depleted crude synthesis gas are preheated through heat exchange with a retentate stream composed of an oxygen depleted retentate formed by separation of the oxygen from the oxygen containing feed stream; and

a make-up water stream, provided for make-up of the steam, is preheated, and the hydrocarbon containing gas stream is preheated through indirect heat transfer with the hydrogen permeate stream.

17. The method of claim 16, further comprising removing sulfur from the hydrocarbon containing feed stream.

18. The method of claim 17, further comprising adding a part of the hydrogen to the hydrocarbon containing feed gas stream.

19. The method of claim 11, wherein:

the oxygen containing feed stream is compressed;

separation of the oxygen from the heated oxygen containing feed stream produces an oxygen-depleted retentate; and

an oxygen-depleted retentate stream composed of the oxygen-depleted retentate is expanded with the performance of work.

20. The method of claim 1 or claim 2, wherein the hydrogen transport membrane is a metal membrane or a proton conducting membrane or a porous ceramic membrane

and the oxygen transport membrane is formed from a mixed conducting material or a dual phase metal and metallic oxide combination.